What is claimed is:

1   1.   A method for fine granular scalability encoding, comprising the steps of:

2   (a)   repeating, for each individual transform block in an image frame, the steps of:

3   (i)   decomposing a respective plurality of residual coefficients for the

4   respective transform block;

5   (ii)   processing a respective plurality of bit-planes or discrete quantization

6   steps for the respective transform block before decomposing coefficients

7   for a next one of the transform blocks in the image frame.

1   2.   The method of claim 1, wherein the transform blocks are discrete cosine

2   transform (DCT) blocks, and the residual coefficients are DCT residual coefficients.

1   3.   The method of claim 2, wherein step (ii) includes run-length and variable length

2   coding each of the plurality of bit-planes .

1   4.   The method of claim 2, wherein step (a) further comprises

2   (iii)   storing each bit-plane at a respectively different position.

1   5.   The method of claim 4, wherein each bth bit-plane of the ith one of the DCT blocks

2   is stored in a location immediately following the location of the bth bit-plane of the $i\text{-}1^{th}$

3   one of the DCT blocks, where b is an integer, and i is an integer greater than one.

1   6.   The method of claim 2, further comprising:

2   (b)   forming a compressed bitstream containing the respective plurality of bit-planes

3   for all of the DCT blocks in the image frame, wherein the data in the compressed

4   bitstream are arranged by bit-plane.

1   7.   The method of claim 6, wherein:

2   step (a) further comprises determining a maximum magnitude of any DCT

3   coefficient for the respective DCT block;

4   the method further comprises determining a maximum one of the maximum

5   magnitudes before step (b); and

6   the data from the plurality of bit-planes are arranged in the compressed bitstream

7   beginning with the bit-plane corresponding to the maximum one of the maximum

8   magnitudes.

1 8.   The method of claim 6, wherein steps (a) and (b) are performed without requiring

2 simultaneous storage of all the DCT residual coefficients for the image frame.

1 9.   The method of claim 1, wherein the plurality of bit-planes includes each bit-plane

2 from a most significant bit-plane to a least signficant bit-plane .

1 10.   The method of claim 1, wherein the transform blocks are formed by one of the

2 group consisting of discrete cosine transform, block-based wavelet coding or matching

3 pursuit and SNR-scalabilities using discrete quantization steps.

1 11.   Apparatus for fine granular scalability encoding, comprising

2   means for decomposing a plurality of residual coefficients for an individual

3 transform block of /an image frame;

4   scanning and coding means for processing a respective plurality of bit-planes or

5 discrete quantization steps for the respective transform block before decomposing

6 coefficients for a next one of the transform blocks in the image frame.

1 12.   The apparatus of claim 11, wherein the scanning and coding means include

2 means for scanning blocks in a first sequence and for storing coded data in a second

3 sequence different from the first sequence.

1 13.   The apparatus of claim 12, wherein:

2   the transform blocks are discrete cosine transform (DCT) blocks, and the residual

3 coefficients are DCT residual coefficients; and

4   each bth bit-plane of the ith one of the DCT blocks is stored in a location

5 immediately following the location of the bth bit-plane of the i-1th one of the DCT blocks,

6 where b is an integer, and i is an integer greater than one.

1 14.   The apparatus of claim 11, wherein the apparatus does not have a memory used

2 for simultaneous storage of all the DCT residual coefficients for the image frame.

1 15.   The apparatus of claim 11, wherein the decomposing means provides residual

2 coefficient data for a block directly to the scanning and coding means without storing the

3 residual coefficient data in an intermediate storage device.

1 16.   The apparatus of claim 11, wherein the decomposing means provides residual

2 coefficient data for a block directly to the scanning and coding means without masking

3 the residual coefficient data to extract data for a single bit-plane from all of the blocks in

4 the image frame.

1   17.   A computer readable medium having computer program code encoded thereon,

2   wherein, when the computer program code is executed by a processor, the processor

3   executes a method for fine granular scalability encoding, comprising the steps of:

4   (a)   repeating , for each individual transform block in an image frame, the steps of:

5   (i)   decomposing a respective plurality of residual coefficients for the

6   respective transform block;

7   (ii)   processing a respective plurality of bit-planes or discrete quantization

8   steps for the respective transform block before decomposing coefficients

9   for a next one of the transform blocks in the image frame.

1   18.   The computer readable medium of claim 17, wherein the transform blocks are

2   discrete cosine transform (DCT) blocks, and the residual coefficients are DCT residual

3   coefficients.

1   19.   The computer readable medium of claim 18, wherein step (ii) includes run-length

2   and variable length coding each of the plurality of bit-planes.

1   20.   The computer readable medium of claim 18, wherein

2   step (a) further comprises storing each bit-plane at a respectively different

3   position; and

4   each bth bit-plane of the ith one of the DCT blocks is stored in a location

5   immediately following the location of the bth bit-plane of the i-1th one of the DCT blocks,

6   where b is an integer, and i is an integer greater than one.

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